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February 14, 2020

VIA ELECTRONIC FILING

The Honorable Jocelyn G. Boyd
Chief Clerk/Administrator
The Public Service Commission of South Carolina
101 Executive Center Drive, Suite 100
Columbia, South Carolina 29210

Re: Joint Petition of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC to Establish a Consolidated Informational Docket for Review and Consideration of Grid Improvement Plans
Docket No. 2019-381-E

Dear Ms. Boyd:

Enclosed for filing please find the Summary Report of South Carolina Duke Energy Grid Improvement Workshop referenced as Exhibit A in Duke Energy Carolinas, LLC's and Duke Energy Progress, LLC's joint response to comments filed by the Southern Environmental Law Center. Exhibit A was inadvertently omitted from the Companies' prior filing.

The Companies appreciate the opportunity to provide additional information and context to the Commission in its consideration of the next appropriate steps in this docket.

Sincerely,

Heather Shirley Smith

Heather Shirley Smith

Enclosure

C: Nanette Edwards, Office of Regulatory Staff (via email)
Dawn Hipp, Office of Regulatory Staff (via email)
Andrew Bateman, Office of Regulatory Staff (via email)
Jeffrey Nelson, Office of Regulatory Staff (via email)
Becky Dover, Department of Consumer Affairs (via email)

Carri Grube Lybarker, Department of Consumer Affairs (via email)
Bridget Lee, Sierra Club (via email)
Robert Guild, Sierra Club (via email)
Carrie Grundmann, Walmart, Inc. (via email)
Stephanie Eaton, Walmart, Inc. (via email)
James Blanding Holman, IV, SELC on behalf of SC NAACP, SCCCL & Upstate Forever (via email)
Michael Lavanga, Nucor Steel – South Carolina (via email)
Robert Smith, III, Nucor Steel-South Carolina (via email)
Richard Whitt, SCSBA and Cypress Creek Renewables (via email)
Scott Elliott, South Carolina Energy Users Committee (via email)
Thadeus Culley, Vote Solar (via email)
Hasala Dharmawardena (via email)

Summary Report of South Carolina Duke Energy Grid Improvement Workshop

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Prepared by Rocky Mountain Institute
Rocky Mountain Institute Contact: Coreina Chan, cchan@rmi.org

Executive Summary

Duke Energy hosted a technical workshop on October 10, 2018 regarding the Company's South Carolina Grid Improvement Initiative to explain the need for and ongoing benefits of grid investments, and to hear feedback from stakeholders in attendance. This workshop was specifically designed to focus on the grid improvement plan and did not address (1) what cost recovery would be used to pay for the plan, or (2) interrelated topics such as regulatory reform or integrated resource planning.

Acting as a neutral facilitator, a team from Rocky Mountain Institute (RMI) convened 57 participants (inclusive of 20 Duke Energy and four RMI staff) for a workshop that included content presentations, structured feedback sessions, and facilitated small group breakout sessions. RMI captured detailed notes for all small group and plenary discussions and conducted an anonymous post-event survey among non-Duke, non-RMI attendees to gather stakeholder feedback.

This document provides a summary of the day's discussions and outcomes, as well as a summary of survey results. This document contains an anonymized synthesis of what was shared by participants, and does not attribute specific comments to specific parties, to respect the ground rules agreed to by participants at the beginning of the meeting. Specifically, participants agreed that what was discussed at the workshop could be shared publicly, but specific comments could not be attributed to individuals without their permission.

The Appendix contains detailed notes from breakout discussions and question and answer sessions.

Workshop objectives

The workshop was organized around three objectives, listed below. RMI defined these objectives in consultation with Duke Energy and other participants interviewed in advance of the event.

- **Objective 1:** Obtain stakeholder input to Duke's outlook on seven megatrends shaping grid improvement decisions.
- **Objective 2:** Describe and get feedback on how Duke Energy has used stakeholder input, the impact of megatrends on grid needs and a prioritization methodology to develop a grid improvement portfolio.
- **Objective 3:** Describe the benefits and risks of the proposed program portfolio and get stakeholder feedback prior to Q4 filing.

Key workshop outcomes and takeaways

As described below, and supported by the rest of this report, there were a number of key workshop insights and outcomes.

1. **Participants generally viewed the pre-read materials and workshop as well-structured and informative, and felt the engagement provided insight into**

Duke Energy's priorities and decision-making processes. Survey and Poll Everywhere results suggest that nearly all stakeholders found this opportunity to review Duke's thinking and process valuable.

2. **Stakeholders were especially interested in further quantitative information about the megatrends and implications portion of the workshop.** For example, several expressed an interest in "seeing numbers" to provide additional detail to the heat maps on slide 34 of the pre-read.
3. **Several stakeholders stated the new plan reflected that Duke Energy had listened to stakeholder feedback.** Stakeholder feedback during the plenary question and answer sessions, online polling and survey indicated that many generally agreed the revised grid improvement filing plan had improved since the first plan.
4. **Generally, stakeholders aligned with Duke Energy on the utility's outlook on megatrends and their implications, but did have key feedback including:**
    a. Costs: several discussion groups pointed out their concerns and questions about how the grid improvement plan would result in rate impacts across different customer groups
    b. Environmental factors: almost all groups mentioned the increasing importance of climate change and how climate change urgency should be given more focus in the megatrends and implications
    c. Technology: general consensus was that the megatrends and implications may be underestimating the impacts of rapid adoption of technologies like solar, storage and electric vehicles
5. **Generally, stakeholders had a positive impression of the Q4 filing but did have key questions and concerns, including**:
    a. What cost recovery mechanism would be used to pay for this plan?
    b. How would benefits/costs be shared equitably by South Carolinians?
    c. What is the quantified vision for renewables penetration and distributed energy resources (DER) hosting capacity?
6. **Stakeholders expressed interest in continued engagement with Duke Energy, both related to the Q4 filing and other future efforts.** Feedback from the plenary, online polling and survey indicated a strong interest in continued engagement.

We obtained stakeholder feedback throughout the workshop via online polling, table discussions, and plenary question and answer sessions. Themes emerging from the conversations during the workshop and in the post-event surveys are summarized in the report, with supporting detail in the Appendix.

Workshop Activities and Attendee List

RMI consulted with both Duke Energy and other participants in pre-workshop meetings and heeded calls to design the workshop agenda to best meet the objectives. The workshop agenda as executed is included below in Table 1.

Table 1: October 10 Technical Workshop Agenda

Time	Activity	Objectives addressed
9:00	Welcome remarks	
9:15	Check-in and introductions	
9:30	Presentation (Duke Energy) Executive Summary: Q4 Filing	#1, #2, #3
9:45	Activity: Polling, feedback and questions	#1
10:25	Presentation (Duke Energy): Megatrends and Implications	#1, #2
11:30	Lunch	
12:15	Presentation (Duke Energy): Portfolio Prioritization Method	#2, #3
12:35	Activity: Polling, feedback and questions	#1, #2, #3
1:15	Presentation (Duke Energy): Q4 Filing Overview	#2, #3
2:15	Next steps for stakeholders	#3
2:30	Closing remarks and adjournment	

A total of 54 participants attended the technical workshop, including 20 participants from Duke Energy and four from RMI. A full list of attendees is included below in Table 2.

Table 2: October 10 Technical Workshop Attendees

Last Name	First Name	Organization Name
Allsbrook	Wes	CEPCI
Blade	Paul	Conservation Voters of South Carolina
Boyt	John	Central Electric Power Cooperative Inc.
Brooks	Jeff	Duke Energy
Brown	Justin	Duke Energy
Burnett	John	Duke Energy
Chan	Coreina	RMI
Claunch	Chuck	Duke Energy
Coppola	Barbara	Duke Energy
Culley	Thad	Vote Solar
Davidson	Hilary	Duke Energy
Dover	Becky	SC Department of Consumer Affairs
Von Nessen	Joey	University of South Carolina
Dyson	Mark	RMI
Ferguson	Stinson	SELC
Finnigan	John	EDF
Fitch	Tyler	Vote Solar
Glenn	Alex	Duke Energy
Hall	Karen	Duke Energy
Hancock	Alan	SC Coastal Conservation League
Hartman	Beth	RMI
Hipp	Dawn	South Carolina Office of Regulatory Staff (ORS)
Hutchison	Nikki	AARP
Jacob	Bryan	Southern Alliance for Clean Energy (SACE)
Jiran	Rick	Duke Energy
Johnson	Sarah	South Carolina Office of Regulatory Staff (ORS)
King	Trip	Audubon South Carolina
Kruse	Susan	Duke Energy
Lawyer	Robert	South Carolina Office of Regulatory Staff (ORS)
Maley	Daniel	Duke Energy
Martin	Jason	Duke Energy
McLawhorn	James T.	Columbia Urban League
Mitchell	William	Conservation Voters of South Carolina
Moore	Eddy	Coastal Conservation League
Morgan	Willie	South Carolina Office of Regulatory Staff (ORS)
Mosier	Ryan	Duke Energy

Oliver	Jay	Duke Energy
Preston	Marcus	Duke Energy
Rice	Chris	Nucor Steel South Carolina
Rivers	Hope	Executive Vice President
Robbins	Shelley	Upstate Forever
Rogers	David	Sierra Club
Ruhe	Mike	Duke Energy
Ruoff	John	SC Appleseed Legal Justice Center
Sandonato	Anthony	South Carolina Office of Regulatory Staff (ORS)
Sharpe	Chris	Duke Energy
Shirley-Smith	Heather	Duke Energy
Simpson	Bobby	Duke Energy
Sipes	Robert	Duke Energy
Slater	Loretta	Whitney Slater Foundation
Smith	Robert	MVA Nucor
Teplin	Chaz	RMI
Wilkerson	Brandon	South Carolina Department of Commerce
Woodberry	Leo	New Alpha Community Development Corporation

Workshop Outcomes

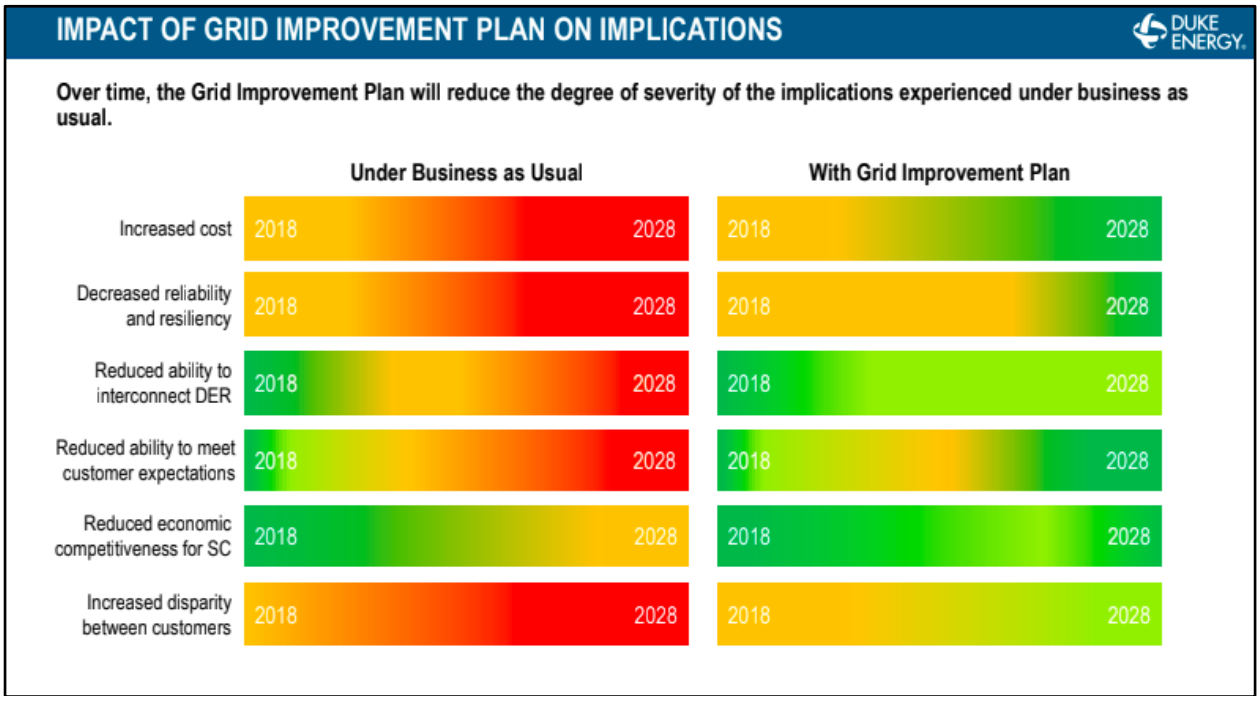
The following sections outline the workshop activities, common themes of discussion, and outcomes associated with each of the three workshop objectives. RMI developed these summaries based on notes taken during the workshop as well as online polling during the workshop and the results of the anonymous survey distributed to participants (excluding Duke Energy and RMI staff) afterwards. There was a 60% response rate to the survey.

Objective 1

Obtain stakeholder input to Duke Energy's outlook on seven megatrends shaping grid improvement decisions.

Supporting Activities

- **Pre-Read**: In the pre-read sent to participants, Duke Energy identified seven megatrends shaping near and long-term grid improvement needs, and the potential implications of these megatrends on customer service under a business-as-usual scenario (no grid improvement). Duke Energy compared the outlook for grid performance under business-as-usual vs. grid improvement plan scenarios, using the following qualitative summary slide:



- **Workshop Presentations**: The fourth quarter filing executive summary at the beginning of the workshop touched on all three main objectives including describing the megatrends and implications for grid improvement decisions. Next, a more detailed presentation from Duke Energy (see Attachments for all presentations) reviewed the seven megatrends impacting the energy industry overall, to explain the rationale for grid improvement investments.
- **Workshop Discussion**: Following the presentation on megatrends and their implications, several feedback activities collected input from stakeholders including a plenary rapid-fire question and answer session, plenary real-time online polling, and facilitated dialogues at tables. Five tables reported out to the room on the key takeaways from their discussions. These discussions were not designed to reach consensus but rather to highlight areas of common interest and concern.

Summary of discussion points

- Costs: several discussion groups pointed out their concerns and questions about how the grid improvement plan would result in rate impacts across different customer groups
- Environmental factors: almost all discussion groups mentioned the increasing importance of climate change and how climate change urgency should be given more focus in the megatrends and implications

- Reliability: several discussion groups mentioned the risk of power interruptions (e.g., during future storms) and the importance of improving reliability in future, especially for industrial customers.
- Technology: several stakeholders voiced that the megatrends and implications may be underestimating the impacts of rapid adoption of technologies like solar, storage and electric vehicles
- Additional key trends identified by participants included (1) flattening load growth, and (2) quickly evolving customer expectations, especially from the next generation(s) of customers.

Gauging Stakeholder Alignment

Real-time polling questions indicated that participants were directionally aligned with how Duke Energy views megatrends. Polling responses indicated similar levels of participant alignment with Duke Energy on potential megatrend implications on customer service and need for a grid improvement strategy:

Figure 1: Real-time online polling responses – "How aligned are you with how Duke Energy views these 7 megatrends?"

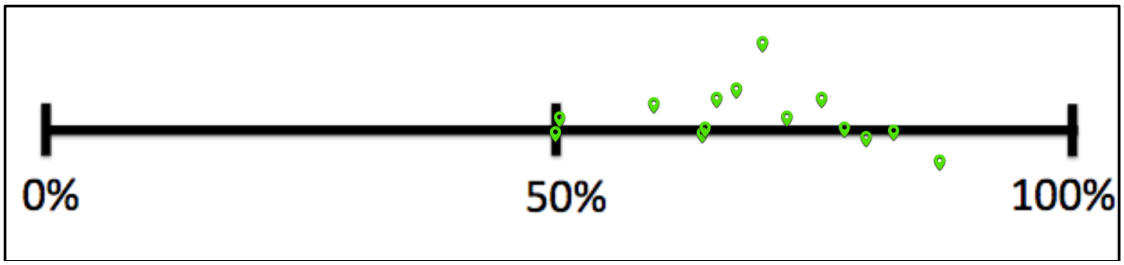
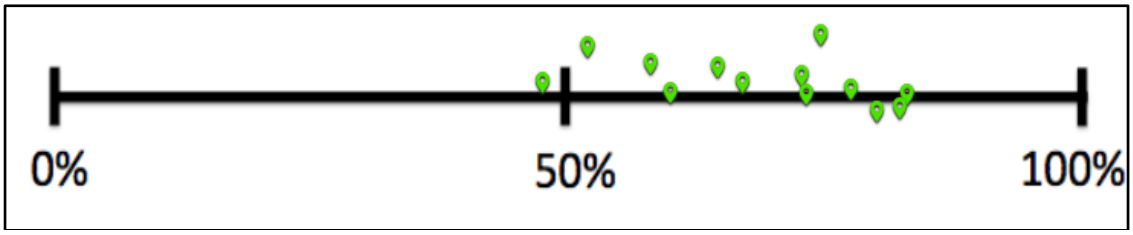
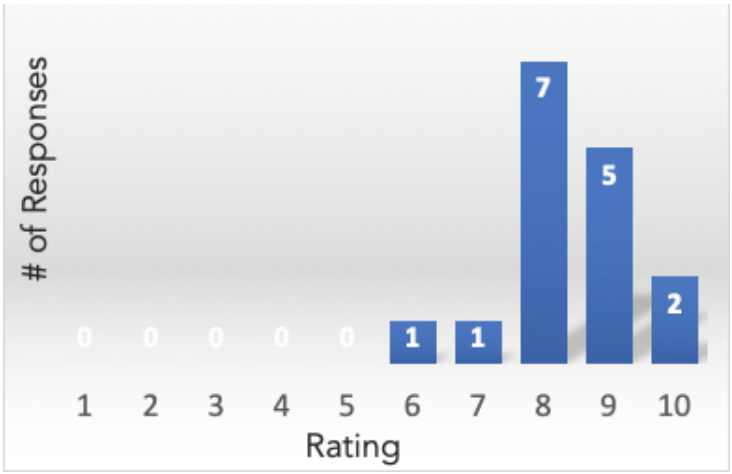


Figure 2: Real-time online polling responses - "How aligned are you with how Duke Energy views the implications to these 7 megatrends?"



In addition to real-time online polling, RMI asked participants to fill out a post-event survey to better understand stakeholder feedback. All participants indicated in the survey that the workshop improved their understanding of Duke Energy's framing of grid improvement in the context of megatrends and implications, with everyone giving a score over 5 out of 10 and the majority of respondents at 8 or above.

Figure 3: Post-event survey responses - "On a scale of 1 to 10, How well did this workshop enhance your understanding of the proposed grid improvement plan?"

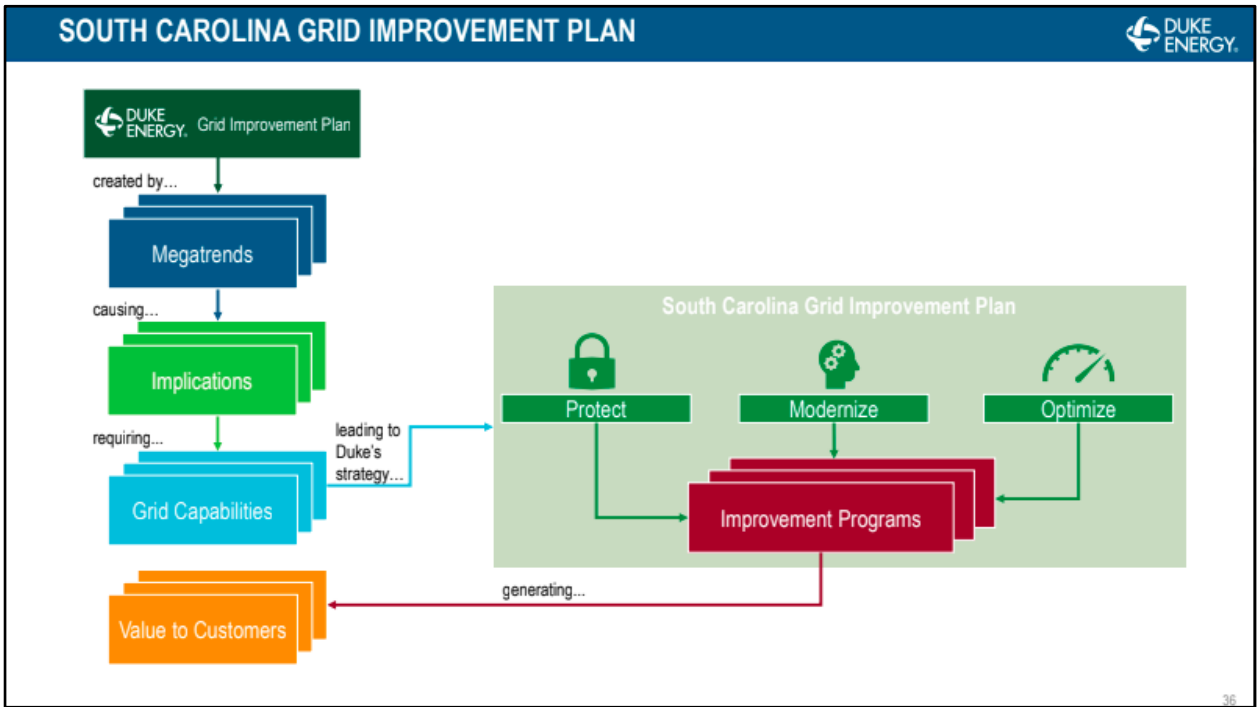


Objective 2

Describe and get feedback on how Duke Energy has used stakeholder input, the impact of megatrends on grid needs and a prioritization methodology to develop a grid improvement portfolio.

Supporting Activities

- **Pre-Read:** In the pre-read sent to participants, Duke Energy outlined their process for using stakeholder input, megatrends and grid needs to create a Grid Improvement Plan. The summary slide is included below.



- **Presentations**: In the first session after lunch, Duke Energy summarized the company's analytic process, including more details on the interruption cost estimate (ICE) model developed by the Department of Energy (DOE) to value the cost of outages. The presentation explained how the company categorizes grid needs as "Optimize," "Modernize," or "Protect" and showed two examples of cost–benefit analysis, one at the program level for self-optimizing grid and one at the project level for targeted undergrounding.
- **Discussion**: After this Duke Energy presentation, participants grouped themselves into pairs to discuss 'What questions, if any, do you have about what was presented?' After 10 minutes, participants were asked to record their questions and the questions were answered in plenary by Duke Energy executives to help raise the overall level of understanding in the room. The questions are listed here:

1) How are environmental benefits calculated?
2) Specifically, what is the formula for DER enablement?
3) What is the discount rate for net present value?
4) Can you provide more detail on ICE, i.e., is it proprietary?
5) How will Duke Energy allocate costs between C&I versus residential customers to reflect benefits?
6) How does Duke Energy distinguish between "maintain" and "improve" for targeted undergrounding?

7) How will you consider the option for microgrids as an alternative to targeted underground more broadly?

Question and Answer Summary

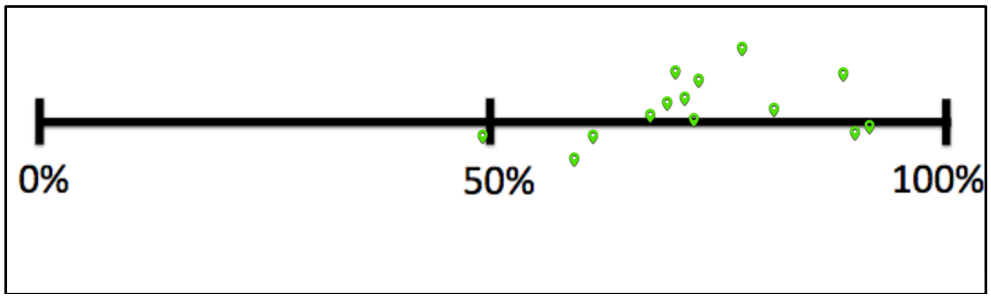
Duke staff answered questions in plenary. Discussion focused largely on environmental benefits and the models used to calculate cost-benefit for different types of programs and projects. These questions and answers were not intended to reach consensus with stakeholders but rather to explain Duke Energy's analytic approach or perspective. Answers are summarized below:

- Environmental benefits were calculated by considering benefits like additional capacity for peak shaving and reduced SO_2, NO_X, and CO_2 emissions. Other benefits of interest to stakeholders included enablement of DER and electric vehicle (EV) charging, and flexibility for other future technologies.
- Net present value calculation uses the appropriate Duke discount rate for the service territory (approximately 7%).
- The ICE model is not proprietary and was created with a DOE-sponsored study to analyze typical costs of service interruptions for various customers including residential, small commercial, and large industrial.
- Targeted undergrounding addresses several megatrends, and projects will be deployed based on cost-benefit analysis to demonstrate value.
- There are many opportunities to use storage and microgrids in ways Duke Energy hasn't before. The focus is on having a positive net present value for storage such as a capacity need or a need to address a community that is underserved. Once you have storage you can use it to island or microgrid during peak demand, or support frequency regulation—the core value is deferring investment.
- All cost savings eventually go to the customer. Grid improvement programs that initially bring savings to Duke Energy will result in those savings being passed along to customers in the form of rates that increase less than under the base case of business as usual.

Gauging Stakeholder Alignment

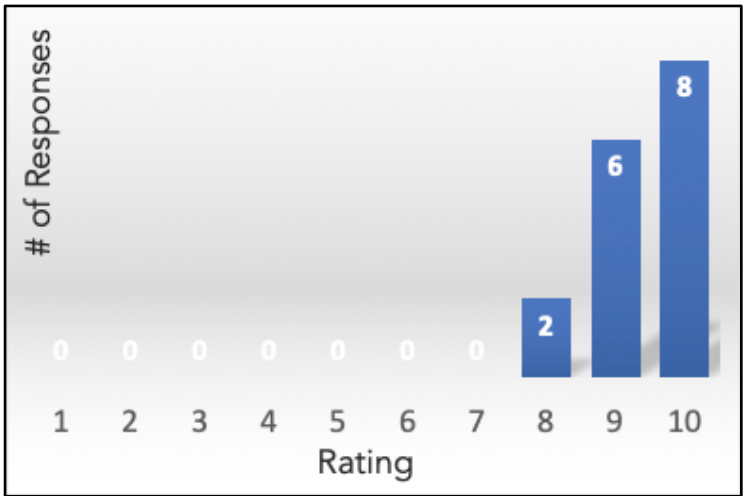
After the plenary question and answer session, participants were asked using real-time polling the following question that is relevant to the second objective: "To what extent do you believe this plan addresses the megatrends discussed earlier today?" The results, below, show that responding participants generally felt the plan addresses the megatrends described by Duke Energy.

Figure 4: Online polling: "To what extent do you believe this plan addresses the megatrends discussed earlier today?"



In addition to the real-time polling, the post-event survey asked participants, "On a scale of 1–10, How satisfied are you with the opportunity to provide feedback and dialogue with Duke Energy?" As shown in Figure 5 below, all 16 completed surveys indicated a score of 8 or higher.

Figure 5: Post-event survey: How satisfied are you with the opportunity to provide feedback to Duke Energy at this workshop?

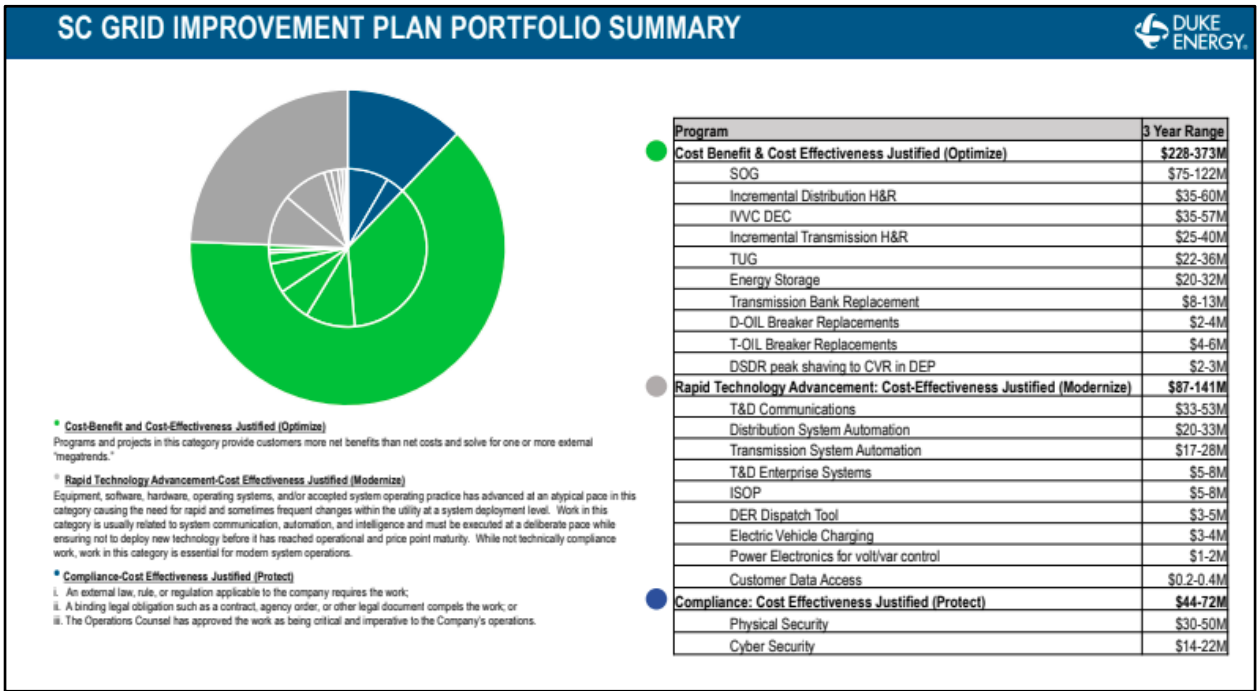


Objective 3

Describe the benefits and risks of the proposed program portfolio and get stakeholder feedback prior to Q4 filing.

Supporting Activities

- **Pre-read**: In the pre-read sent to participants, Duke Energy outlined their Grid Improvement Plan in more detail, including cost ranges for each program area. The summary slide is included below.



SC GRID IMPROVEMENT PLAN PORTFOLIO SUMMARY

DUKE ENERGY

Program	3 Year Range
Cost Benefit & Cost Effectiveness Justified (Optimize)	**$228-373M**
SOG	$75-122M
Incremental Distribution H&R	$35-60M
IVVC DEC	$35-57M
Incremental Transmission H&R	$25-40M
TUG	$22-36M
Energy Storage	$20-32M
Transmission Bank Replacement	$8-13M
D-OIL Breaker Replacements	$2-4M
T-OIL Breaker Replacements	$4-6M
DSDR peak shaving to CVR in DEP	$2-3M
Rapid Technology Advancement: Cost-Effectiveness Justified (Modernize)	**$87-141M**
T&D Communications	$33-53M
Distribution System Automation	$20-33M
Transmission System Automation	$17-28M
T&D Enterprise Systems	$5-8M
ISOP	$5-8M
DER Dispatch Tool	$3-5M
Electric Vehicle Charging	$3-4M
Power Electronics for volt/var control	$1-2M
Customer Data Access	$0.2-0.4M
Compliance: Cost Effectiveness Justified (Protect)	**$44-72M**
Physical Security	$30-50M
Cyber Security	$14-22M

• **Cost-Benefit and Cost-Effectiveness Justified (Optimize)**
Programs and projects in this category provide customers more net benefits than net costs and solve for one or more external "megatrends."

• **Rapid Technology Advancement-Cost Effectiveness Justified (Modernize)**
Equipment, software, hardware, operating systems, and/or accepted system operating practice has advanced at an atypical pace in this category causing the need for rapid and sometimes frequent changes within the utility at a system deployment level. Work in this category is usually related to system communication, automation, and intelligence and must be executed at a deliberate pace while ensuring not to deploy new technology before it has reached operational and price point maturity. While not technically compliance work, work in this category is essential for modern system operations.

• **Compliance-Cost Effectiveness Justified (Protect)**
i. An external law, rule, or regulation applicable to the company requires the work;
ii. A binding legal obligation such as a contract, agency order, or other legal document compels the work; or
iii. The Operations Counsel has approved the work as being critical and imperative to the Company's operations.

- **Presentations:** Several presentations focused on describing the benefits and risks of the proposed program portfolio and getting stakeholder feedback prior to the Q4 filing. Specifically, the workshop started with a Q4 executive summary presentation and concluded with a more detailed overview of the filing. This detailed overview included a breakdown of the costs by program as well as a discussion of the heatmaps developed to explain the implications of megatrends and grid impacts.
- **Questions:** Following the detailed filing overview presentation, the workshop transitioned to an open question and answer session in plenary with several members of the Duke Energy staff. Many of the questions focused on the heat maps and addressed uncertainties in factors like renewable integration, EV adoption, and more. Costs and issues of customer equity also continued to be areas of focus.

Summary of Q&A

  - Why is the heat map showing reduced ability to meet customer expectations with the orange in the middle? Duke Energy's response: There is uncertainty with factors like EVs and batteries and what will happen with expectations quickly changing around adoption of these new technologies.
  - With regards to the reduced ability to connect DER in the improvement plan, what is the plan missing that would enable this to go from yellow to green? Duke Energy's response: The lighter shade of yellow represents an effort to optimize what we are doing to address the impacts in the most

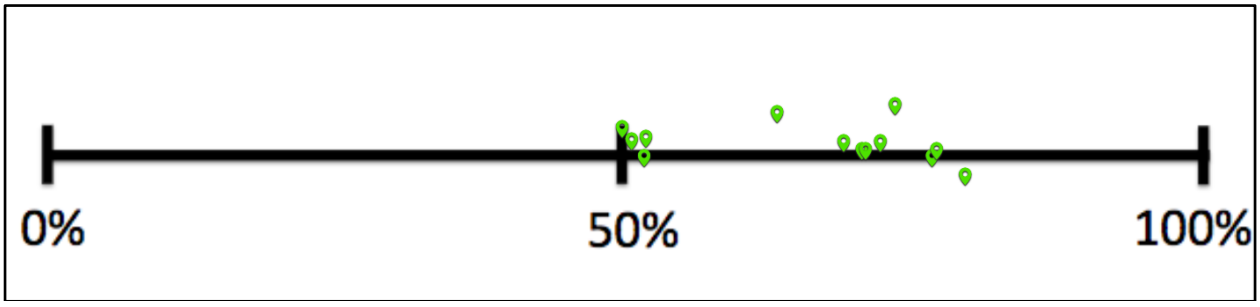
cost effective way and also reveals uncertainty about trends in electric cars or batteries.

- Why is the heat map showing increased disparity between customers? Duke Energy's response: urban areas are growing and rural populations are declining—the traditional utility model is to serve the most load, which in this case would mean greater investments in urban areas, and fewer in rural. This plan includes deploying some electronics on the rural lines to reduce outages, easing the disparity between the self-optimizing urban grid and the rural service.
- With grid improvement, are you predicting costs will eventually be lower and will this correlate to a decrease in rates? Duke Energy's response: Yes, over the base case. When these programs kick in they will be more valuable than not. To do this cost-benefit analysis Duke Energy erred on the conservative side of only capturing the hard costs.

Gauging Stakeholder Feedback

Finally, the workshop transitioned to real-time polling questions to gather data from the entire room on overall support for the fourth quarter grid improvement filing plan. Overall, stakeholders were clustered in groups of around 50% support for the plan and closer to 75% support as described in Figure 6 below:

Figure 6: Online polling responses: "Based on what you've heard today, how supportive are you of this plan at this time?"



- **Final Discussion:** Following the plenary presentation, question and answer session, and online polling, the group separated into final table discussions around two questions: what are the strengths of this plan, and what issues and concerns do you have? Feedback from these discussions was captured by a Duke Energy representative taking notes at each table.

Summary of Table Discussion Points: Overall, workshop participants were supportive of Duke Energy's efforts to incorporate stakeholder feedback, and felt that the updated grid improvement plan was better than the first version. The ability to incorporate more

DERs along with increased amounts of storage, reduced targeted undergrounding, and a stronger focus on optimizing technologies like integrated volt/VAR control (IVVC) were all highlighted as positive elements of the plan. Concerns focused on cost and rate impacts along with more details on metrics and goals for DER integration and reduced centralized generation. Outside of plenary discussions, breakout groups discussed feedback on the filing and three tables reported back in plenary:

1. Participants at this table felt that Duke Energy had focused on listening to stakeholder feedback to revise the grid improvement plan. Specifically, stakeholders appreciated the inclusion of more storage, ability to accommodate increased renewables, and the focus on a self-optimizing grid. Their main issues and concerns focused on the unknown costs and rate impacts, along with an interest in learning more about how the plan would impact the transmission system in addition to the distribution system.
2. Participants were similarly supportive of Duke's focus on listening to and incorporating stakeholder feedback, specifically mentioning the use of a neutral third-party facilitator as a positive element of the input process. Concerns were also focused on cost impacts in addition to workforce development plans. There was also an interest in better understanding the differences between the first and second version of the filing plan, specifically asking why IVVC wasn't included in the first plan.
3. Along with incorporating stakeholder feedback, this group highlighted specific positive elements of the plan including flexibility, viewing DER as an opportunity rather than a threat, scaled back undergrounding efforts, and more robust cost-benefit analysis efforts. Concerns focused on costs, metrics and goals for DER integration, and more planning for less centralized generation.

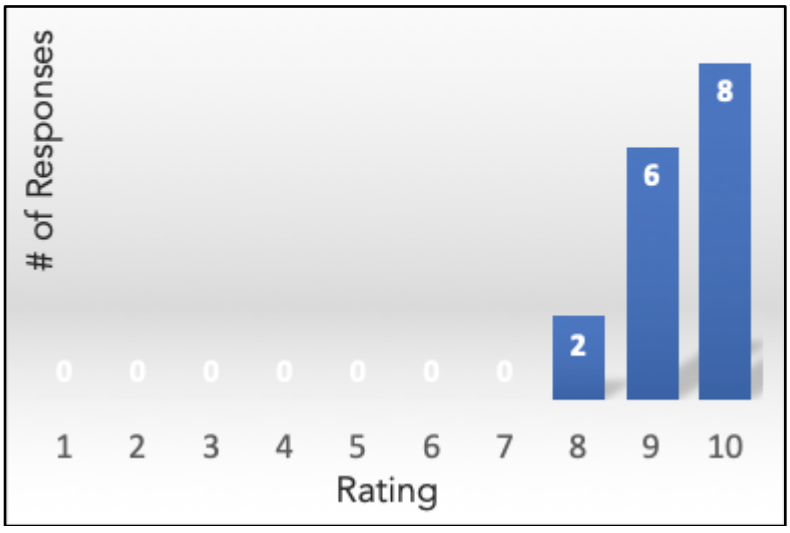
Final Stakeholder Feedback

After this final round of discussion, Duke Energy collected a final round of feedback with survey responses. Based on these responses, participants overall indicated interest in continuing to engage with Duke Energy on grid improvement planning, and a majority stated that the workshop provided an effective foundation for future collaboration. Responses to each final survey question are summarized below:

Figure 7: Survey Question 1: "On a scale of 1–10, how well did this workshop enhance your understanding of the proposed grid improvement plan?

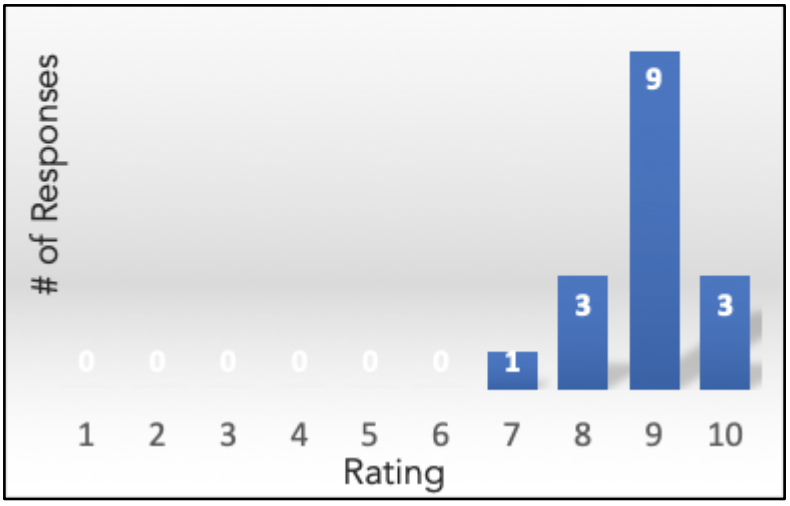
The first post-workshop survey questions asked attendees to assess how well the workshop improved their understanding of Duke Energy's grid improvement plan. The chart above shows the number of respondents that rated the workshop with a given rating. The 16 responses suggested that the workshop did improve their understanding of the plan: no responses rated the workshop less than 6 and 14 of the 16 responses rated the workshop greater than 7 on this question.

Figure 8: Survey Question 2: "On a scale of 1–10, how satisfied are you with the opportunity to provide feedback to Duke Energy at this workshop?



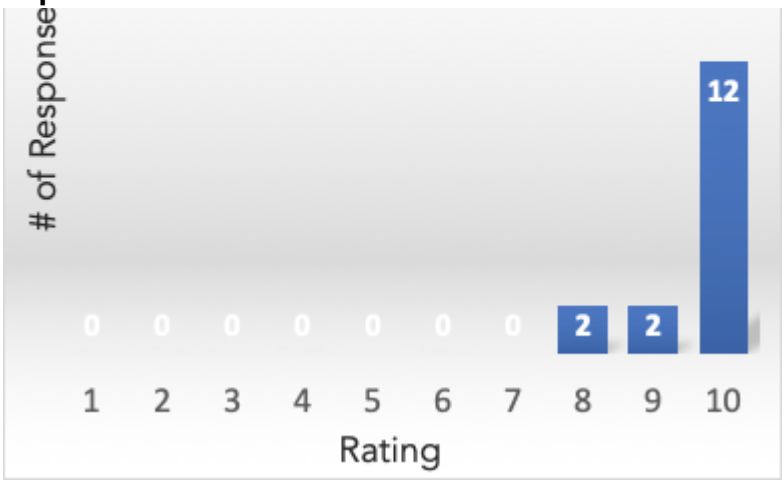
The second post-workshop survey question asked attendees to assess how well the workshop allowed them to provide feedback to Duke Energy. The chart above shows the number of respondents that rated the workshop with a given rating. The 16 responses indicate that attendees did feel that they had a chance to give Duke Energy feedback: no responses rated the workshop less than 8 and 14 of the 16 responses rated the workshop greater than 8 on this question.

Figure 9: Survey Question 3: "On a scale of 1–10, how well did this workshop enhance your understanding about other stakeholders' points of view?



The third post-workshop survey question asked attendees to assess how well the workshop allowed attendees to improve their understanding of other stakeholders' point of view. The chart above shows the number of respondents that rated the workshop with a given rating. The 16 responses suggested that the workshop did allow attendees to hear the perspective of other workshop attendees: no responses rated the workshop less than 7 and 12 of the 16 responses rated the workshop greater than 8 on this question.

Figure 10: Survey Question 4: "On a scale of 1–10, how willing are you to engage in potential future follow-up conversations with Duke around proposed grid improvement initiative?



The last post-workshop survey questions asked attendees if they were willing to engage in a future conversation with Duke around grid improvement. The chart above shows the number of respondents that rated the workshop with a given rating. The 16 responses suggested that the workshop attendees are overwhelmingly willing to engage with Duke on grid improvement going forward: all responses were an '8', '9' or '10' and 12 of the 16 responses were '10.'

Appendix 1: Executive Summary

After Duke Energy presented an initial executive summary of their view on the future of the grid, their process for creating an improvement plan and their Q4 filing plan, participants were asked “Based on what you just heard, what are the most urgent questions you have for Duke Energy about the Q4 filing?” RMI staff documented stakeholder questions posed on post-it notes below, grouped into the following categories:

- **Cost, Rate Impacts, Cost Recovery and Equity**, focused on plan costs and how those costs would be balanced among ratepayers:
    - What are the total cost and rate impacts?
    - What is the impact on the customer’s cost and bill?
    - What are the rate impact and how will allocations and rate design be done?
    - What are you doing to protect consumers from a rate payer perspective (stabilizing costs)?
- **Distributed Energy and Renewables Integration**, focused on the extent to which grid improvements would enable future grid hosting capacity, and timeline, and on what timeline.
    - What assumptions is the preparing-for-renewables-section based on?
    - How will the proposed grid improvements increase opportunities for renewable energy especially solar?
    - How will this second proposal increase DER integration compared to the first proposal?
    - At what total level will DER be integrated and on what timeline?
- **Cost-benefit** focused on detailed cost-benefit analysis of the proposed grid improvements.
    - Where is the detailed cost-benefit study?
    - What is the real value to each customer class?
    - When can we see the cost-benefit analysis for specific programs?
    - How is the value to customers balanced across classes?
- **Workforce Development**, focused on how and whether the plan opens up new opportunities for local jobs, and constraints on local trained worker capacity.
    - What is the community education plan?
    - Can you provide more information on the workforce development component and the role that the technical college system can play?
    - What is the impact on workforce development?
- **Others**
    - What is the grid improvement plan for the 44 KV transmission system in the DEC area?
    - What are you doing to protect the grid against artificial intelligence and cyberthreats?
    - What are the net environmental impacts?

Appendix 2: Megatrends and Implications

Q&A:

After Duke Energy's Megatrends and Implications presentation, participants had a chance to ask clarifying questions that were answered in real-time by Duke Energy representatives. This section provides a summary of the questions posed by stakeholders to Duke Energy staff, and notes from staff's real-time responses.

- "Why would you not add as an implication increased reliance on fossil fuels and environmental and cost implications of that?"
    - Cost risks of fossil fuels under business as usual are carried through as an understanding in all the implications presented. Under a business as usual where DER would not be enabled to as great a degree, baseload generation using fossil fuels would continue.
    - In certain programs we quantify base capacity avoidance and fuel implications from the grid improvement plan.
- "Do you foresee the plan addressing some of the transmission issues that are affecting some areas?"
    - Yes, various programs address these issues, including the program for the 44 kV DEC area, programs that impact intermittency and power quality, programs for volt-VAR control, and the DER dispatch tool that would address potential needs to curtail solar.
- "When I think about demographics I think about social and economic demographics. Can we focus on social and economic demographics rather than typical demographics like age, etc.?"
    - Yes, Duke Energy is thinking about all our customers for this plan.
    - For the low-income example, the fuel savings and energy usage savings from IVVC will create automatic efficiency and avoid capacity payment for future generation.
- "Could you tell us about the math behind the heat maps?"
    - At this point the heat maps are highly qualitative — in the nearer term we have more confidence in our data but moving out farther in time we get less quantitative and more qualitative.
- "[When will this plan cause...] increased customer options for rates?"
    - The impact to customer rates will occur as programs are implemented and new rates are approved by the Commission.
- "If avoiding increased costs is one of the primary goals (which should mean savings for consumers), do you have a sense of the balance between when you have to capture costs in order to implement, and when we as consumers will see those savings?"
    - The answer to that question is program dependent.

- For example, the DEP volt-VAR control program has a high potential payback of around 30 to 1; you will spend money over 4 years and that money will "come back quickly."

Polling Questions

Following the Q&A, participants answered polling questions and engaged in table discussion on those questions.

"How aligned are you with how Duke Energy views these seven megatrends?"

Several stakeholders offered explanations for why they responded as they did:

- 75%: One stakeholder agreed with Duke Energy on the megatrends but felt they don't sufficiently capture the full importance of climate change. The stakeholder referred to the Intergovernmental Panel on Climate Change report released the same week as the workshop to underscore the importance of climate change.
- 75%: Another stakeholder also largely agreed with Duke Energy and mentioned that his organization gets involved with grid modernization programs around the country to help ensure they are implemented in a cost-effective way. The stakeholder was involved in the grid modernization plan in North Carolina and had an opportunity to present recommendations. Looking at the megatrends that were identified here it appears that Duke Energy adopted many of the suggestions.
- 50%: Another stakeholder was closer to halfway agreement, not because he disagreed that those are the megatrends we are seeing today, but because having worked on utility issues for 40 years, he recognizes the large degree of uncertainty around trends. Part of the challenge in developing trend outlooks is building in flexibility and sharing risk around "who pays for inaccurate projections."
- 50%: Another stakeholder was at 50% or lower agreement because of the need for greater emphasis on weather impacts. This stakeholder also highlighted and expressed support for the trend NGOs have for looking for energy solutions that are more community based.
- 50%: A final stakeholder was also at 50% or lower because she felt that the plan gave insufficient focus to impacts on the environment.

"How aligned are you with how Duke Energy views the implications for South Carolina?"

Stakeholders offered explanations for why they responded as they did:

- Stakeholders indicated that their answers to this polling question were largely reflected in their responses to the previous question on megatrends.
- One stakeholder added that environmental factors should be a larger component of the implications.

Table discussions

Stakeholders were asked to discuss the following question: "Where do you share common ground with Duke Energy? What's missing? Where do you differ? Why?

Common themes among the responses included:

- Costs: Several discussion groups raised concerns and questions about how the grid improvement plan would result in rate impacts across different customer groups.
- Environmental factors: Almost all groups mentioned the increasing importance of climate change and how climate change urgency should be given more focus in the megatrends and implications.
- Reliability: Several groups mentioned the risk of power interruptions (e.g., during future storms) and the importance of improving reliability in future, especially for industrial customers.
- Technology: Several stakeholders voiced that Duke Energy's megatrends and implications presentation may be underestimating the impacts of rapid adoption of technologies like solar, storage and electric vehicles
- Additional key trends identified by participants included (1) flattening load growth, and (2) quickly evolving customer expectations, especially from the next generation(s) of customers.

Detailed documentation of table discussion post-its follows:

Megatrends

- "Where do you share common ground with Duke Energy?"
    - "All"
    - "All"
    - "General Agreement"
    - "All, with some more focus on uncertainties"
    - "Generally, acknowledge listed trends but …"
    - Customer Expectations
    - Changing Customer Expectations
    - "Protecting Consumers from Cyber Threats"
    - "Physical Threats"
    - "Threats to Infrastructure"
    - "Cyber threats are real concerns to many customers – including seniors"
    - "Weather Events (incr. Frequency, severity, duration)"
    - "Agree that the grid needs improvement"
    - "Technology Advancement – EV adoption, storage prices"
    - "Environmental Trends"

    - "Top 3 Trends: (1) Technology Advancements/Grid Improvements, (2) Environmental, (3) Weather Events (dependent on data). Trends need emphasis"

- "What's missing? Where do you differ?"
    - "Different 'customer of tomorrow'
    - "Aging Line workforce"
    - "Grid reliability and improvement (transmission) is essential for serving a growing state (and growing state industry)"
    - "Missing: Is there an added service such as high-speed internet"
    - "More electric: More connected appliances/homes"
    - "Rate of change is ramping up"
    - "'Electrify Everything' scenario (as another megatrend? – or supplement on technology advancement [in addition to EVs])"
    - "Climate change driving fossil fuel use"
    - "More emphasis on climate"
    - "Enough weight on EV Budgets?"
    - "Declining Load Growth"
    - "Detach from utility (going off grid)"
    - "Flat load growth missing"

Implications of Megatrends

- "Where do you share common ground with Duke Energy?"
    - "All"
    - "Can't stand still and can't go backward (Business as Usual won't work)"
    - "Agree on identification of implications"
    - "How can you break down the language for low-income people in a form to understand better."
    - "How will the company show how, in low-income communities, grid improvement will be used in their home?"

- "What's missing? Where do you differ?"
    - "Big Policy $wings – Impact of corporate tax structure. Hit on customer bills. Climate Δ/energy policy. Deregulation (especially transmission & distribution)"
    - "Disproportionately Impact low income"
    - "Missing: customer affects / behavior modification"
    - "Cost must be considered and remain reasonable"
    - "What does this mean for solar non-utility size (solar) solutions? Rooftop/Community."
    - "How do we integrate NGO solar (DER) solutions into the grid (Interchange)
    - "How much job growth?"
    - "How can low income people participate in job growth?"

- "How can we develop more resilience (security) with storms?"
- "Cost may actually decline – missing: business model"
- "Updated regulatory construct and business model to take advantage of markets"
- "Optimize response to megatrends"
- "How are these weighted?"
- "Unanticipated catastrophic events"
- "But maybe not degree of harm under business as usual (BAU)"
- "Fossil Fuel Environmental and price implications w/ BAU"
- "Does Grid Mod give both NC/SC an economic development advantage?"
- "Disparity on who can own an EV"
- "Load implications of younger generation"
- "Equity w/respect to rates or benefits of service, especially for low income"

Appendix 3: Program Prioritization Method

Full notes: Duke Analytic Process Questions

Description of process: Following the Duke Energy presentation on the company's analytic process for developing the grid improvement plan, stakeholders asked questions in plenary. This section provides a summary of the questions posed by stakeholders to Duke Energy staff, and notes from staff's real-time responses.

- "How do you calculate the environmental benefits – using [data or reports from the] EPA or some other data?"
  - For self-optimizing grid, we tried to quantify benefits from additional capacity to address peak shaving. Another environmental benefit is the enablement of future DER capacity like rooftop solar and EVs. These technologies have a range of potential adoption penetration and growth, and also range in resources required to prepare for that. We used an external consultant to help with these estimations.
- "We would love to see more detail on the environmental benefits analysis."
  - The company makes assumptions around inputs such as how much EVs and battery storage are going to grow—we can share these assumptions and we are open to feedback.
- "For the net present value calculation, what discount rate was used?"
  - We used the appropriate company discount rate for the service territory, approximately 7%. We've seen other cost benefit analysis which didn't use our rate; however, we felt it would be more conservative to use our rate.
- "Can you provide more info on the ICE model [and how it is used to quantify the] value of lost service, and whether this is a proprietary methodology?
  - ICE is not a proprietary model. It is based on a DOE-sponsored study to analyze typical costs of service interruptions for various customers including residential, small commercial, and large industrial. The model

assigns an average for momentary interruptions and different lengths of hours, and we've seen it is the best tool available to value what "being without power" really means.
    - The ICE model does not take into account outages longer than 16 hours, so it does not give you the value of major events like hurricanes. That is a whole different analysis that the ICE tool is not designed for.
- "With these examples, it seems that a lot of benefits flow to commercial customers. How are you going to allocate costs to ensure they pay? As a second question, for Targeted Undergrounding, how are you differentiating between maintain TUG [programs] and grid mod TUG [programs]?
    - The TUG programs address several of the megatrends. Based on stakeholder feedback to the initial plan, we have scaled back the amount of TUG and focused the current plan on individual projects.
    - Using these initial individual projects, we plan to prove the value of TUG and how it addresses megatrends...and then complete more projects more based on this value.
    - For the question on how costs are allocated, we looked at programs that address momentary interruptions. This TUG project was unusual because of the number of commercial customers near a line also serving residential customers.
- "For the cost/benefit of targeted undergrounding, are you also considering how to enable a microgrid to [be integrated into those geographies]?"
    - There is a lot of opportunity to use storage in ways we haven't used it before. The important focus for Duke Energy is to have a positive net present value for storage, e.g., it meets a capacity need or a need to address a community that is underserved.
    - Then, once you have the storage, you can use it to island or microgrid during peak demand, or support frequency variation. But the core value is deferring investment.
- "How do you handle the differences between customer and utility benefits when calculating net present value? "
    - All costs eventually go to the customer — savings for the utility goes to the customer in the end, so it's beneficial if the utility saves.
    - Regarding direct customer benefits around the self-optimizing grid, in addition to going around outages, the program also enables two-way power flow through automated switches controlled by a central hub that allows us to change configurations and manage more DER on the system.

Appendix 4: Q4 Filing Overview

Q&A:

Following the Duke Energy overview presentation on the company's proposed near final fourth quarter filing for grid improvements, company staff took questions in plenary from participants. This section provides a summary of the questions posed by stakeholders to Duke Energy staff, and notes from staff's real-time responses.

- "For the heat map showing reduced ability to meeting customer expectations, what is going on with the orange in the middle?"
    - The orange reflects uncertainty around factors like EVs and batteries, and around expectations about the adoption of these new technologies. In the near term future we aren't sure how these will be immediately managed, but in the long run we are confident we can support these technologies (reflected by the green shown further out in time in the heat map).
- "With regards to the Implication titled "reduced ability to connect DER," the improvement plan is better than BAU but still seems like a slow demise.[...] What is the plan missing that would enable it to [actually improve]?"
    - The lighter shade of yellow reflects uncertainty from and around addressing impacts "in the most cost-effective way."
    - This includes uncertainty around technologies like electric cars or batteries.
- "What's going on with the increased disparity between customers on the bottom [heat map]?"
    - The traditional utility model is to serve the most load, which in the case of South Carolina would imply investing more in urban areas, and less in rural. If we can deploy some electronics on the rural lines to reduce outages, this would ease the disparity between the self-optimizing urban grid and the rural service.
- "Costs are a dire picture under business as usual. With grid improvement, are you predicting costs will eventually be lower, and will this correlate to a decrease in rates?"
    - Yes, over the base case. When these programs kick in they will create relative value, resulting in a decrease in rates compared to business as usual. IVVC is a great example in the short term; by better managing the voltage, we will help lower costs to customers.
    - It's more effective to do something proactively and well planned than reactively when the system has reached a breaking point.
    - For any of these programs, are we going to see bill returns? We think so. We've erred on the more conservative side of capturing only the benefits to hard costs; we have not included valuation of holistic benefits..

- "Is this plan [being created under existing planning processes and methods for grid improvement relative to integrated resource planning] or would a new process be developed integrated planning?"
    - We are looking at planning as both an enterprise process and as a system, so it could be used across jurisdictions.
    - A phased approach will be used for a few principle things like software, analytics, and integration of that into the global plan for the utility.
    - We continue to reach out for best practices, stakeholder engagement, and lessons learned.
- "Do you have any more insight on hosting capacity?"
    - We have discussed hosting capacity in North Carolina, which takes over a year or two or work to do correctly. We are working with a new software package that will help us work on hosting capacity more efficiently than we are today.
    - We are aiming to focus on solving for enterprise level infrastructure and functionality.

Polling Questions

Several stakeholders offered to provide an explanation to the plenary on where they placed their cursor on the real-time polling question about overall alignment with the filing plan, and why:

- 75%: One stakeholder was uncertain investments in grid improvement will actually create opportunities for DER and skepticism on how the investments lead to future decreased costs.
- 50%: Another stakeholder was unsure the implications of the grid improvement plan on rates and total revenue requirement, which customers will pay. Without knowing this, this individual found it hard to say, 'Thumbs up.'
- 50%: This stakeholder stated that uncertainty in costs make it difficult to fully support the plan.
- 75%: One stakeholder stated this plan is better than the original version that was introduced in North Carolina, but there is some remaining skepticism around if certain programs fit as grid modernization.
- 75%: Another stakeholder is supportive of setting the foundation for and building data analytics capability for future DER integration.
- 60%: This stakeholder stated that grid improvement is necessary, but it's still unclear how the plan will result in benefits and costs. Additionally: we need a diversified approach to solving the energy problems in South Carolina, balanced with the need for renewables and energy efficiency. We also need to be investing in other things as well — this is a lot of money that could be supporting other efforts.

Table Discussions

Participants were asked to discuss and document "What are the strengths of this plan? What issues, concerns, or questions do you need to raise?" For this activity, RMI tasked Duke Energy representatives with documenting what they heard from stakeholders on post it notes.

Report out in plenary:

Three tables presented out on the highlights of their discussion

1. Table 1: Participants felt that Duke Energy had focused on listening to stakeholder feedback during the revision process for the grid improvement filing plan. Specifically, stakeholders appreciated the inclusion of more storage, ability to accommodate increased renewables, and the focus on a self-optimizing grid. Their main issues and concerns focused on the unknown costs and rate impacts, along with an interest in learning more about how the plan would impact the transmission system in addition to the distribution system.
2. Table 2: Participants were also observed that Duke Energy had incorporated stakeholder feedback into the plan and identified the use of a neutral third party facilitator as a positive element of the input process. Concerns focused on cost impacts and opportunities for workforce development. Participants expressed an interest to better understand the difference between the first and second version of the filing plan, and specifically queried why IVVC didn't seem to be included in the first plan.
3. Table 3: The following aspects of the plan resonated as positive among this group: flexibility in design of the plan, reduced undergrounding investments, and improved cost-benefit analysis and report out. Some participants expressed they view DER as an opportunity rather than a threat. Concerns focused on costs, metrics and goals for DER integration, and their desire for planning to focus more on decentralized generation.

The follow section captures digitally the detailed notes from Duke Energy staff at discussion tables:

What are the strengths of this plan?

- Stakeholder involvement and listening/responding
- Self-optimizing grid
- Outage updates via text
- DER dispatch tool
- Battery storage is starting to show up in grid plan
- Accommodates small solar and battery
- Starting to capture costs experienced by customers
- Refreshing to hear ability to deal with DER being taken into consideration
- More EVs and storage

- Reliability improvement is key component
- Refreshing to hear stakeholder feedback will be integrated
- Responsiveness of version 1 to feedback
- Big improvement over NC approach
- Stakeholder process with neutral 3rd party expert
- Narrowed focus to relevant trends compared to last time
- Provided good distinction between BAU and GIP with clear options for future
- Stakeholder input reflected
- Flexibility of plan
- 3 years more feasible than 10 years
- More user friendly
- More national views
- Tone more receptive to DER—not painted as a problem but a solution
- Better definition of projects
- Cost benefit by project better than last version
- Scaled back TUG to prove benefit

<u>What issues, concerns, or questions do you need to raise?</u>

- Why wasn't IVVC in the original plan?
- What are the differences between the first and second plans?
- Important to lay out as much of the future plan as possible
- Important to communicate how these investments facilitate efficiency and behavior decisions
- Re: 44 kV lines where? How? When?
- Not much info on cost stabilization over time
- Want more info on workforce development plans
- Want more info on future assumptions related to solar penetration
- Want more info on which programs contribute to which grid capabilities
- How long will this investment and cost increase last? Not clear
- Looking for how costs and budget will be allocated, i.e., EV vs. transmission
- Generation planning: need less centralized generation, impacts to IRP
- IRP not showing retirements related to grid improvements
- Securitization for stranded assets: effective, efficient retirement of assets
- Making the most of the potential—Biggest DER is EE, may not need grid improvement for leveraging EE, what's the true customer value?
- Cost allocation
- Implementation execution risk
- More project by project details
- Cost overruns and timelines lengthening
- More info on macro view of megatrends vs. individual trends
- Opportunities to mitigate rate impacts to low income needs more discussion
- More definition around how stakeholder process continues over 10-year life of plan

- Metrics and goals for DER integration
- Does grid mod improvement provide “perfect power” or markedly improved at plant site?
- Integrated VAR level with Grid Mod—does this help at plant level and can plant be relieved of their VAR control?
- Are there synergies with customer and utility? Customer operating characteristics paired with utility costs
- Rate impact TBD
- Need more info on transmission (not just distribution)
- Need more on hardening the transmission system
- Transmission capacity impacting economic development
- Reliability not as big an issue for some groups, varies by types of customer class (e.g., hospitals)
- Aligning who pays for benefit
- Cost and who pays?
- Need to capture customer outage costs greater than 16 hours
- Need to plug into non-profit groups as partners and education
- More community involvement to understand benefits